Remarks

The Office Action mailed March 23, 2004 has been carefully reviewed and the foregoing amendment has been made in consequence thereof.

Claims 1-32 are now pending in this application. Claims 1-7, 9, 11-13, 15-21, 23, 25-27, and 29-32 stand rejected. Claims 8, 10, 14, 22, 24, and 28 stand objected to. No claims have been cancelled or amended, and no claims are newly added.

No extension of time is believed to be necessary for entry of this Amendment. However, if an extension of time is required, please consider this a request for the necessary extension of time. A Request for Continued Examination (RCE) Transmittal accompanies this Amendment and includes an authorization to charge a Deposit Account for the RCE fee, and, if necessary, authorization to charge the Deposit Account for any necessary extension of time and any other fees that may be required for entry of this Amendment.

Applicants note the objections to the drawings under 37 C.F.R. 1.83(a). Submitted herewith is a new Figure 6 showing an example of a "curved plane of reconstruction" recited in the claims. Amendments have also been made at appropriate locations in the specification to refer to the new figure. The new Figure 6 adds no new matter, as it is supported by the specification as originally filed at page 6, lines 12-13, where it is recited that each curved plane is defined by boundary conditions given by regions cited in eqns. 1-4. See also page 12, lines 4-5. Figure 6 is an illustration of an example of one of the curved planes, and thus adds no new matter. The curved reconstruction plane is also supported by Figure 3 and the specification describing Figure 3, as originally filed. Boundaries of each block shown in Figure 3 are slanted lines forming an angle with respect to the dotted lines in Figure 3, which indicate different beta values. The boundaries indicate straight lines in the projection domain. However, those lines map to a double cone shape in the reconstruction plane.

For the reasons set forth above, Applicants request that the objections to the drawings be withdrawn.

The rejection of Claims 30 and 32 under 35 U.S.C. § 112 as failing to comply with the written description requirement is respectfully traversed.

The Office has asserted that the phrase "the more than two conjugate samples that are located on only one side of the curved plane of reconstruction" in Claim 30, and a similar recitation in Claim 32, is not supported by the specification. The Office correctly notes that at page 7, lines 13-15 of the specification, an embodiment of the present invention is described in which only two samples used for estimating the at least one projection are located on only one side of the curved plane of reconstruction. However, it is clear from page 7, lines 13-15 that this passage is reciting one embodiment of the present invention as an example. On the other hand, at page 5, lines 3-6, it is clear that other embodiments can use as many samples as the sampling pattern supports. Moreover, at page 7, lines 3-8, configurations are described in which three sampling points are located on both sides of a point x where interpolation is to take place.

Because the specification makes clear that more than two conjugate samples can be located on only one side of the curved plane of reconstruction in some configurations of the present invention, it is evident that Claims 30 and 32 are directed to configurations different from that recited at page 7, lines 13-15, but nevertheless supported in the specification as originally filed.

For these reasons, it is submitted that the rejection of Claims 30 and 32 under section 112 is incorrect and should be withdrawn.

The rejection of Claims 1-5, 9, 11, 15-19, 23, and 25 under 35 U.S.C. § 103(a) as being obvious over the combination of Taguchi et al. (U.S. Patent No. 5,974,108) and Nambu et al. (U.S. Patent No. 6,196,715) is respectfully traversed.

As correctly analyzed by the Office, Taguchi et al. does not disclose a curved plane of reconstruction. However, the Office asserted that curved planes of reconstruction are exceedingly well known in the art and that Nambu discloses a curved plane of reconstruction for which at least one projection is estimated at Figure 43. Applicant respectfully disagrees

with both the assertion that curved planes of reconstruction are well-known and that Nambu discloses a curved plane of reconstruction.

At Figure 43, Nambu discloses a curved plane of *projection*, which is to be distinguished from a curved plane of *reconstruction*. A plane of projection is a plane at which raw data is collected. A plane of reconstruction is a plane at which an image is reconstructed. The two different planes are totally different in purpose and concept. Also, Figure 43 of Nambu does not demonstrate or provide support for the Office's (incorrect) assertion that a curved plane of reconstruction was well-known in the prior art.

Regarding curved planes of projection, if a set of projection data is acquired from a flat detector, one may want to remap the projection data from the flat detector to a curved detector. In doing so, it would be necessary to resample the projection data. Figure 43 of Nambu is an illustration of one configuration of this resampling process. See also col. 7, lines 52-53 and col. 35, lines 39-67. Flat panel detectors can collect projections just as CT scanners with curved detectors. What Nambu is describing is the collection of data with a one type of detector, and the resampling of that data to mimic the data that would have been detected had the detector had a different geometry. There is no teaching or description of reconstructing an image in a curved plane. Indeed, data collection geometry has nothing to do with image reconstruction geometry. For example, a flat detector could be used to reconstruct an image in a curved reconstruction plane, or a curved detector could be used to reconstruct the same image.

The present invention is concerned with reconstruction, not data collection, and Applicants do not believe that Nambu et al. disclose a curved plane of reconstruction, nor that such an image reconstruction plane is "exceedingly well-known in the art." If the assertion of what is exceedingly well known in the art is based upon the personal knowledge of the Examiner or another employee of the Office, it is respectfully requested that this person provide a declaration under 37 C.F.R. 1.104(d)(2) so that Applicants can have a proper opportunity to rebut this assertion.

By contrast, Claim 1 as currently pending recites "... estimating at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples ..." Nowhere in Taguchi or Nambu is estimation of a projection along a curved plane of *reconstruction* taught or suggested. Rather, Figure 43 refers to a curved resampling plane in projection space. As noted above, a curved projection plane has nothing to do with a curved reconstruction plane, as they can be independent of one another. Moreover, the project that is being estimated in Claim 1 does not necessarily have to be curved. Thus, Claim 1 is respectfully submitted as being patentable over the combination of Taguchi and Nambu.

Claim 15 recites similar features and is submitted to be patentable over the combination of Taguchi and Nambu for the same reasons.

Claims 2-5, 9, and 11 depend, directly or indirectly, from independent Claim 1. When the recitations of Claims 2-5, 9, and 11 are considered in combination with the recitations of Claim 1, Applicant submits that dependent Claims 2-5, 9, and 11 likewise are patentable over Taguchi in combination with Nambu. Furthermore, Claims 16-19, 23, and 25 depend, directly or indirectly, from independent Claim 15. When the recitations of Claims 16-19, 23, and 25 are considered in combination with the recitations of Claim 15, Applicant submits that dependent Claims 16-19, 23, and 25 likewise are patentable over Taguchi in combination with Nambu.

For the reasons given above, it is submitted that the rejection of Claims 1-5, 9, 11, 15-19, 23, and 25 as being obvious over the combination of Taguchi et al. and Nambu et al. is incorrect and should be withdrawn.

The rejection of Claims 6-7, 12-13, 20-21, and 26-27 under 35 U.S.C. § 103(a) as being obvious over the combination of Taguchi et al. and Nambu et al. and further in view of Berlad (U.S. Patent No. 5,513,120) is respectfully traversed.

Taguchi et al. and Nambu et al. are as described above. Neither of these references either alone or in combination teach or suggest "estimating at least one projection along a

curved plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples" as recited in Claim 1.

Berlad is directed to an interpolation filter that enables interpolation without changing the values of the interpolated points coinciding with the sampled data points, the signal content of the original images, or the variance of the original image. Nowhere does Berlad teach or suggest a curved plane of reconstruction.

By contrast, Claim 1 as currently pending recites "... estimating at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples ..." Nowhere in Taguchi, Nambu, or Berlad separately or in combination is estimation of a projection along a curved plane of *reconstruction* taught or suggested. Therefore, Claim 1 is submitted to be patentable over the combination of Taguchi, Nambu, and Berlad. Claim 15 recites similar features and is submitted to be patentable of this combination for substantially the same reasons.

Claims 6, 7, 12, and 13 depend, directly or indirectly, from independent Claim 1. When the recitations of Claims 6, 7, 12, and 13 are considered in combination with the recitations of Claim 1, Applicant submits that dependent Claims 6, 7, 12, and 13 likewise are patentable over the combination of Taguchi, Nambu, and Berlad. Furthermore, Claims 20, 21, 26, and 27 depend, directly or indirectly, from independent Claim 15. When the recitations of Claims 20, 21, 26, and 27 are considered in combination with the recitations of Claim 15, Applicant submits that dependent Claims 20, 21, 26, and 27 likewise are patentable over Taguchi, Nambu, and Berlad.

For the above reasons, it is submitted that the rejection of Claims 6-7, 12-13, 20-21, and 26-27 as being obvious over the combination of Taguchi et al. and Nambu et al. and further in view of Berlad is incorrect and should be withdrawn.

The rejection of Claims 29 and 31 under 35 U.S.C. § 103(a) as being obvious over the combination of Taguchi et al., Nambu et al. and Berlad, and further in view of King et al. (U.S. Patent No. 5,233,518) is respectfully traversed.

Taguchi et al., Nambu et al., and Berlad are as described above. None of these references either alone or in combination teach or suggest "estimating at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples" as recited in Claim 1.

King is directed to method for reducing image helical scanning artifacts in computed tomography imaging systems. The method divides 360 degrees of projection data into two half scans. Separate weighting functions are applied to the two half scans and they are reconstructed to an image per conventional reconstruction techniques. Weighting functions provide effective interpolation and extrapolation of the half scan data to a slice plane centered in the projection data. See abstract. The term "slice plane" (which refers to a flat plane, as shown in the figures) or "imaging plane" is recited in several places in the specification (e.g., col. 4, line 9; col. 5, line 1; col. 5, lines 35-36; col. 6, line 11; col. 7, line 60, and col. 8, line 19). Nowhere is a curved plane of reconstruction taught or suggested by King.

By contrast, Claim 1 as currently pending recites "... estimating at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples ..." Nowhere in Taguchi, Nambu, or Berlad separately or in combination is estimation of a projection along a curved plane of *reconstruction* taught or suggested. Therefore, Claim 1 is submitted to be patentable over the combination of Taguchi, Nambu, Berlad, and King. Claim 15 recites similar features and is submitted to be patentable of this combination for substantially the same reasons.

Claim 29 depends directly from independent Claim 1. When the recitations of Claim 29 are considered in combination with the recitations of Claim 1, Applicant submits that dependent Claim 29 likewise is patentable over the combination of Taguchi, Nambu, Berlad, and King. Furthermore, Claim 31 depends directly from independent Claim 15. When the recitations of Claim 31 are considered in combination with the recitations of Claim 15, Applicant submits that dependent Claim 15 likewise is patentable over the combination of Taguchi, Nambu, Berlad, and King.

For the above reasons, it is submitted that the rejection of Claims 29 and 31 as being obvious over the combination of Taguchi et al., and Nambu et al., Berlad, and King is incorrect and should be withdrawn.

In view of the foregoing amendments and remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully Submitted,

June 23, 2004

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